Recent Use of DES in Naval Technology, Platform, Force Architecture, and CONOPS Evaluation Methodologies

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Intro

- Background
- Methodology
- Scenario
- Model(s)
- Findings
- Conclusions

Motivation

- **US Navy is evaluating alternative Platforms and CONOPS for support of Ship-To-Objective-Maneuver / Operational Maneuver From The Sea (STOM / OMFTS)…**
  - **New systems are potentially game changing… Some are in procurement, others are still concepts; all need evaluation**
  - **Novel Logistics System Architectures, taking advantage of the new capabilities, are being formulated, evaluated, and ranked**

1942 1975 2015?

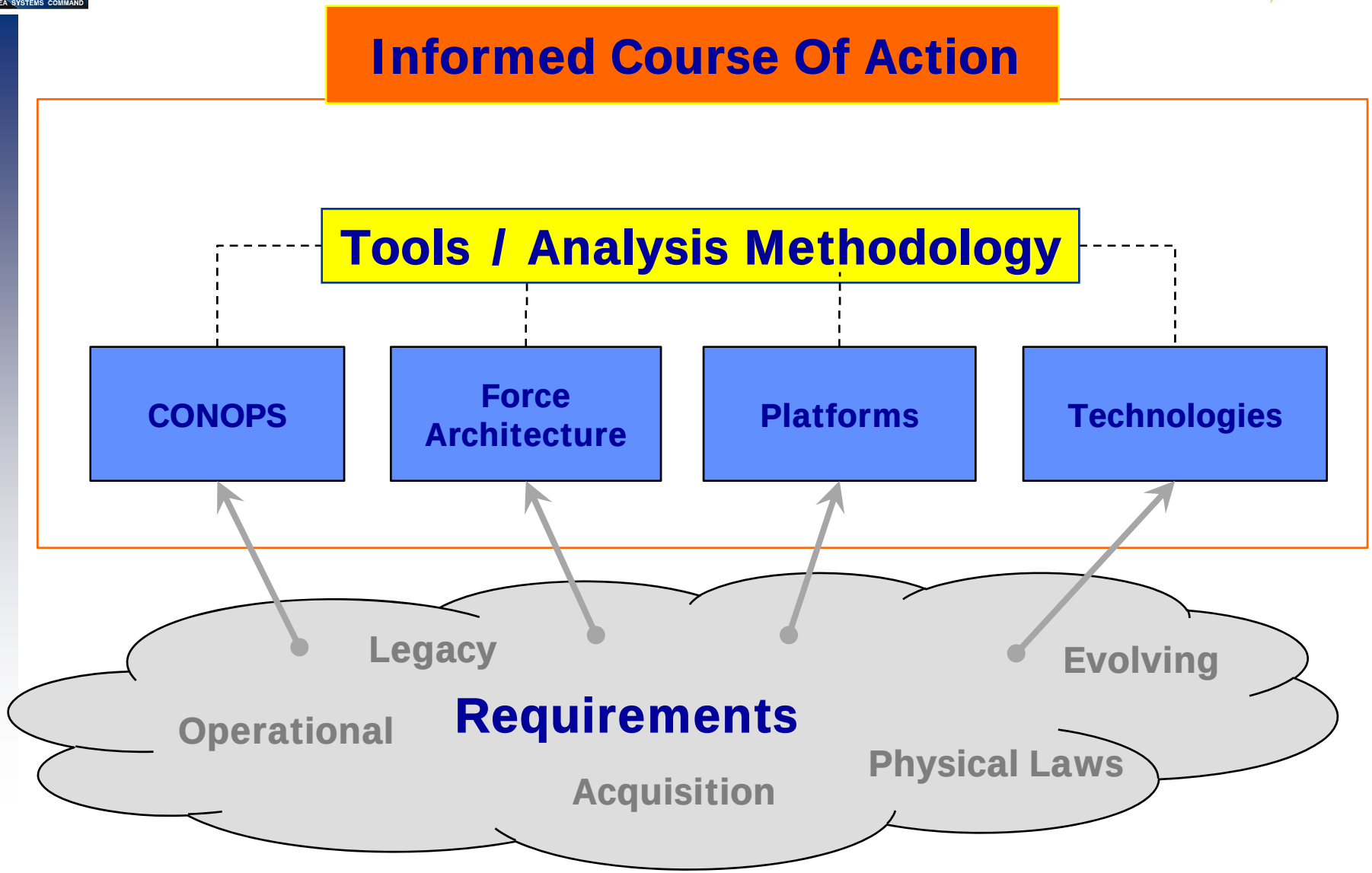
High Speed Logistics Amphibian Characteristics

- **Planing hull, retractable wheel amphibian**

Size	12m LWL, 3m Beam
Cargo Capacity	6.5 LT
Cargo Fraction	0.25
Gross Vehicle Weight	26 LT (58240 lb)
Water Speed	25 knots

  - **Cargo Fraction consistent with range of historical amphibian designs, but may be conservative for a modern design**
  - **Cargo deck and capacity are equivalent to a long-bed MTVR at off-road load capacity**
  - **Dual diesel powering assumed for fuel consumption calculations**

Philosophical Approach



Overall Scenario Description

I. Supplies to Direct to Objective

10 V-22s
100 miles

Beach

Input

At Sea

Expeditionary Strike Group

II. Supplies Direct to Objective

12 HSLAs
100 miles

Objective

USMC MEU(SOC) Units of Action

Output

IIIa. Supplies to Beach Transfer Point

4 LCACs
25 miles

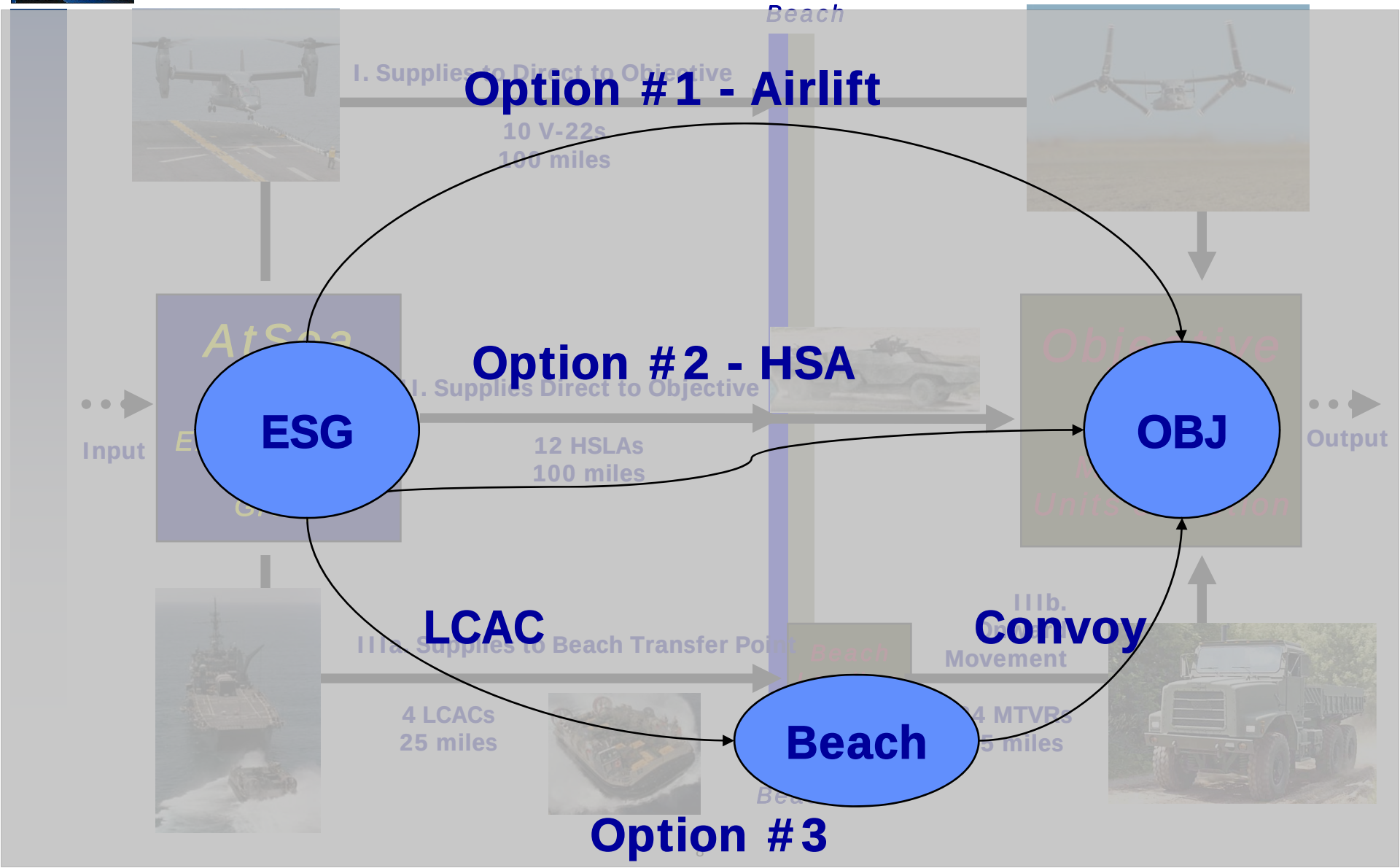
Beach Landing Area

Beach

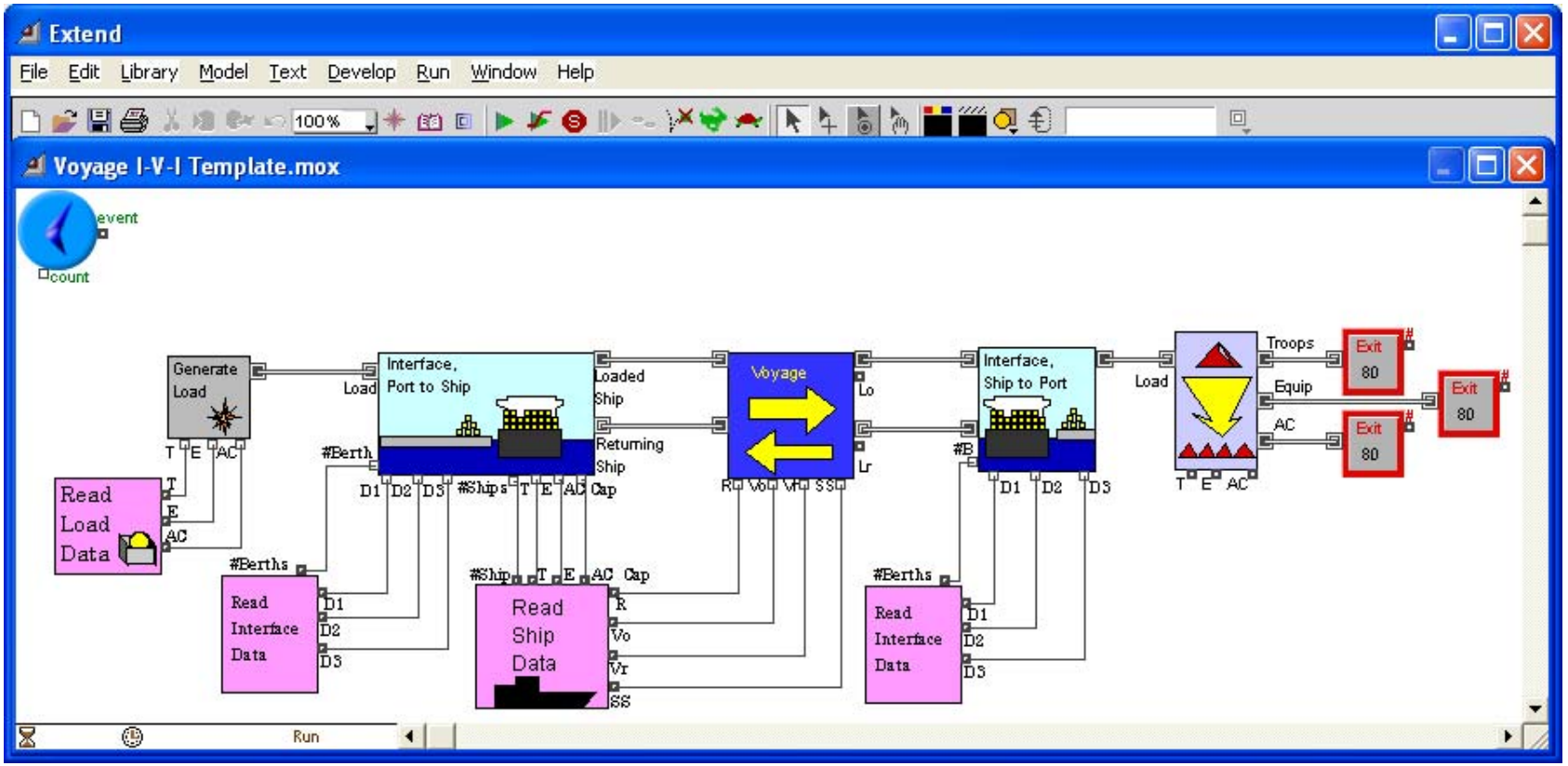
IIIb. Onward Movement

24 MTVRs
75 miles

Leg Network Diagram



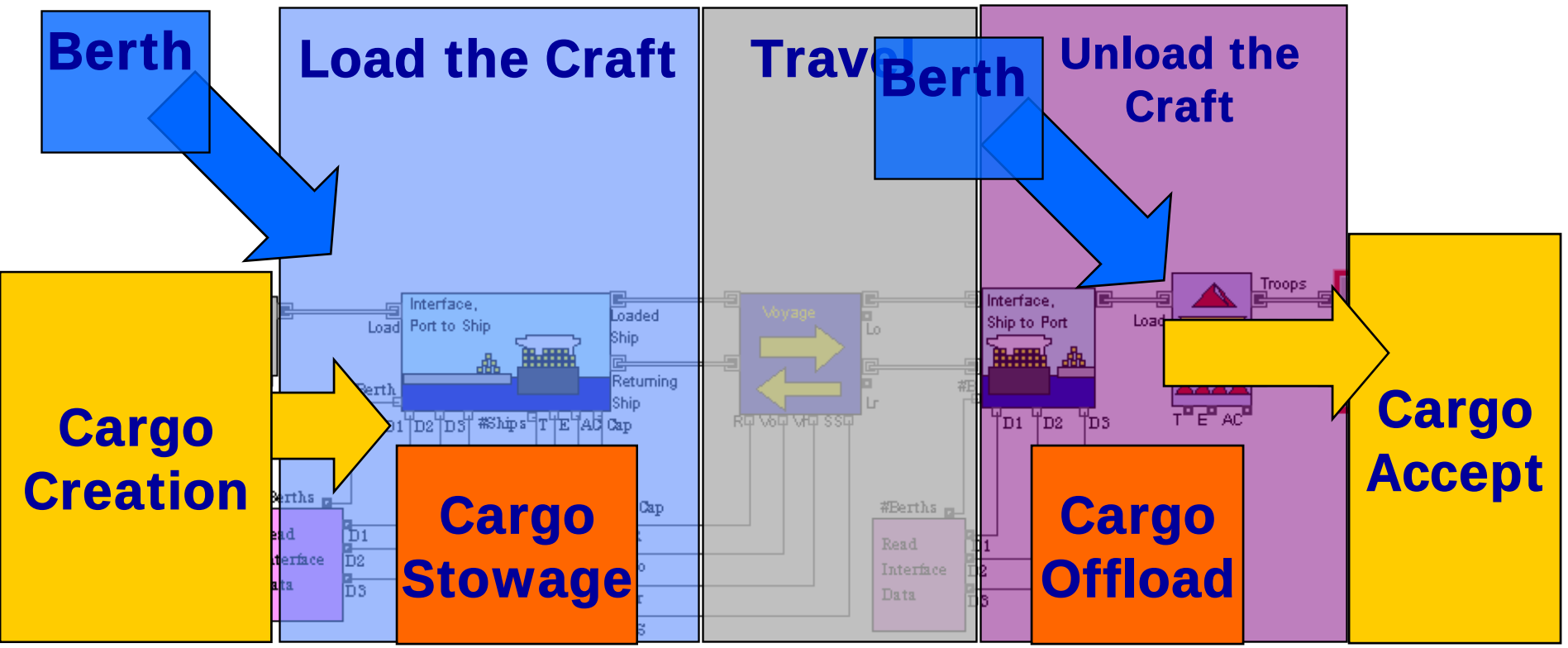
Reusable Base Object: Transport Leg



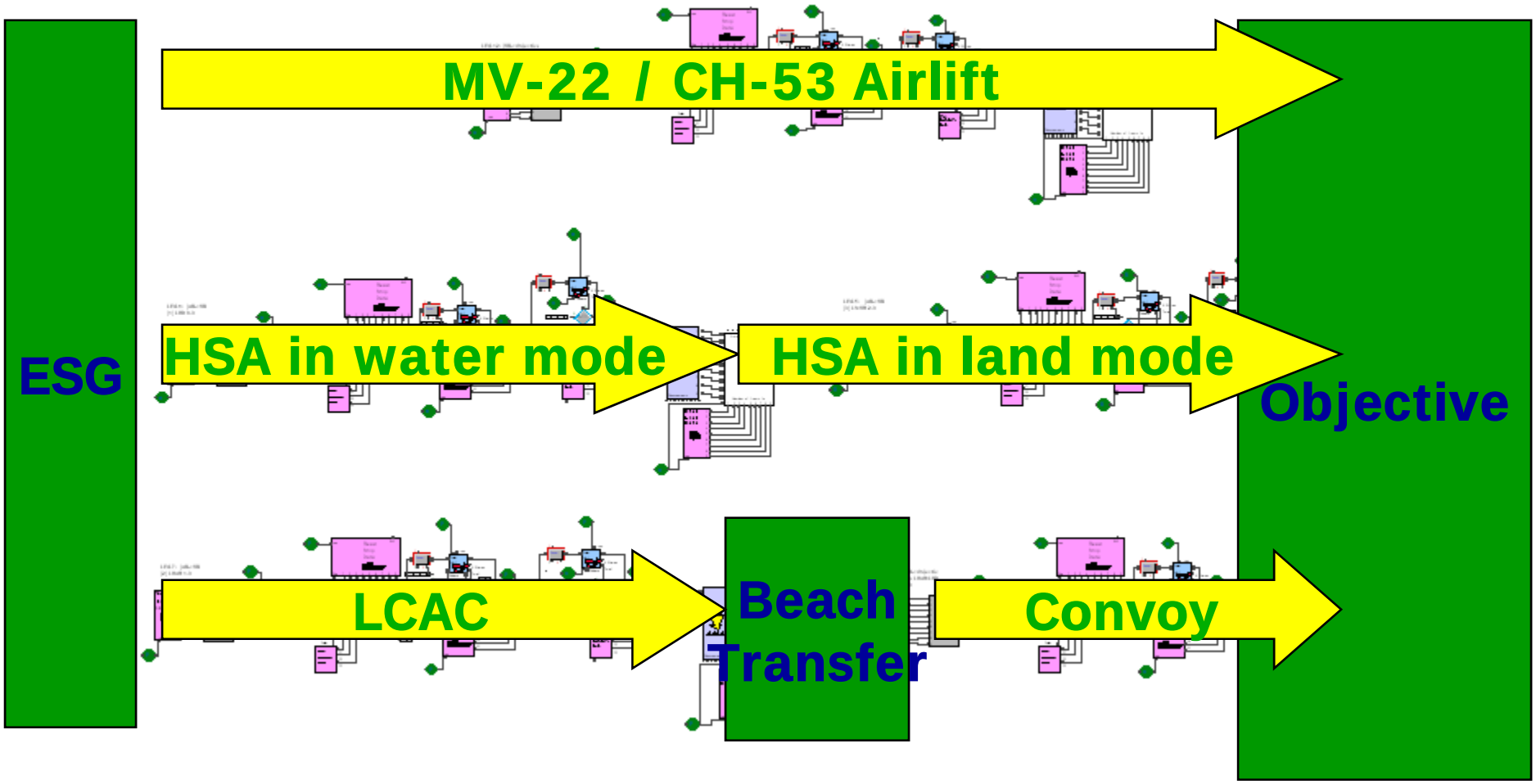
Interface-Voyage-Interface LEG

Pt A → Pt B

Reusable Base Object: Transport Leg



Model Example



Findings

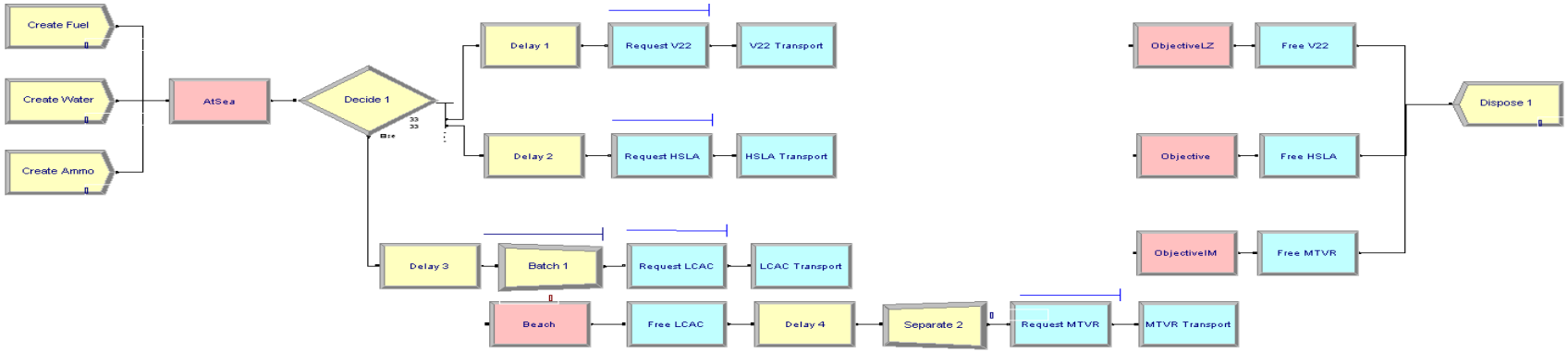
- **This was the third study to use CAESaR to analyze Technology-Platform-Force Architecture mixes**
  - **At this point, clearly supports a validated methodology for comparative analysis…**
  - **particularly for mixtures of platform types…**

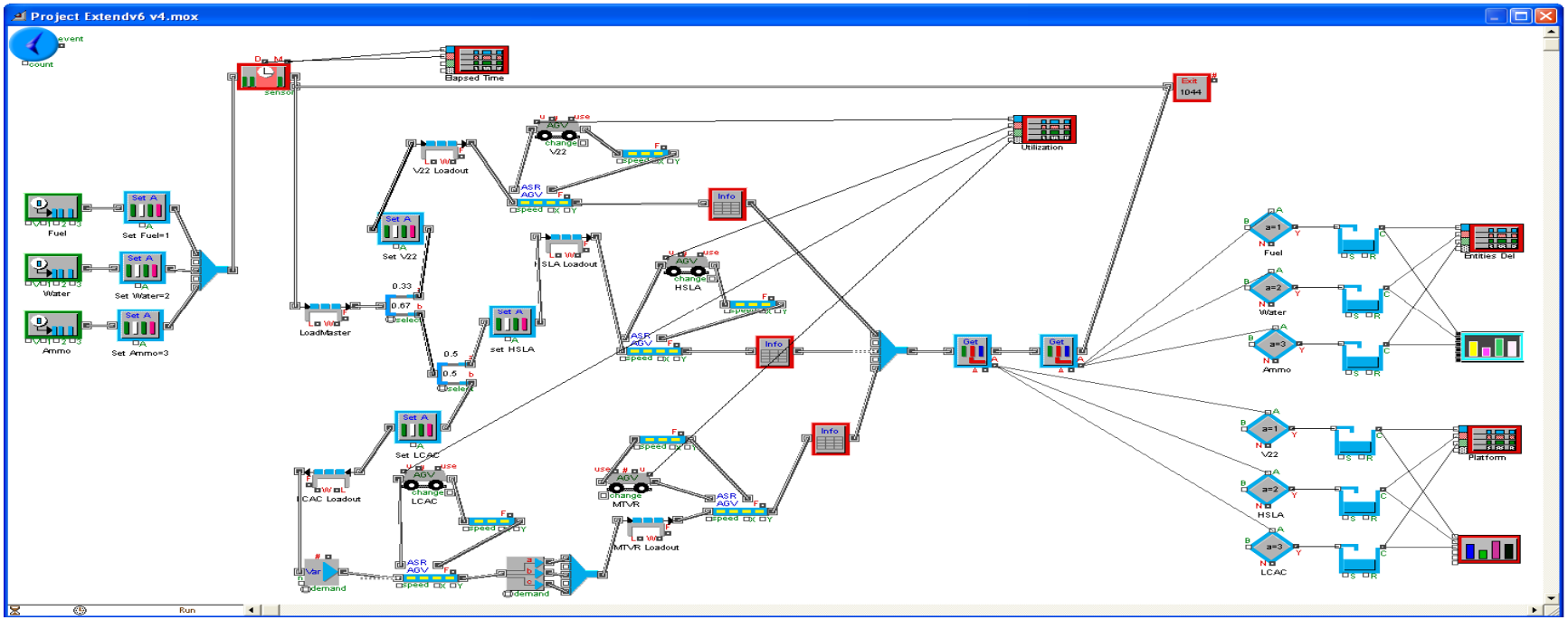
- **HSLA Performance**
  - **Very preliminary (ROM) results**
  - **Strong throughput performance compared to LCAC/convoy option**
  - **Provides flexibility in connector dispatching**
  - **Merits further study**

Lower LOD Modeling

- Led to some interesting results, but also raised a key question:
  - The HSA Scenario is much simpler than the one the original model was delivered…
  - Could a simpler, purpose built model be developed to confirm results of CAESaR runs?
- To attempt an answer, a Lower Level Of Detail (LOD) QuickLook Models were developed
  - Using same Scenario depiction, and simplified parameterizations of transport elements
  - One model in Extend, one in Arena…
  - Durations of modeling effort in each tool were captured
  - Models were run through similar mix of scenarios

Resultant QuickLook Models





Findings

- **Use of lower LOD models provided second set of data points regarding architectural performance.**
  - **Independent, “double-blind” effort provides confidence that things were “reasonably well modeled”**
  - **Might actually be more suitable for ROM Concept Cost analysis, given how costs roll up and aggregate… more detailed models might miss this**

Conclusions

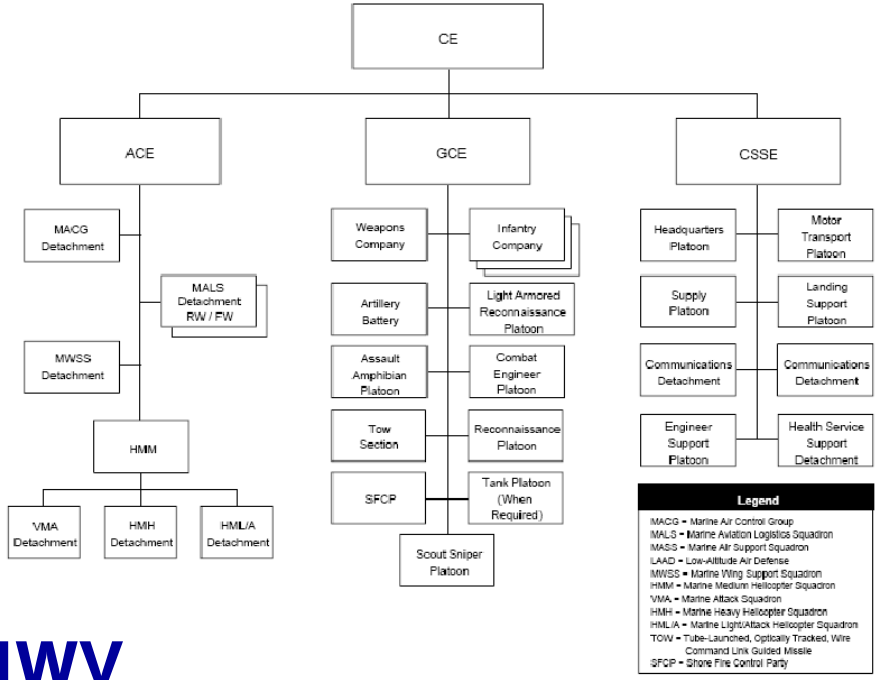
- **Which comes first (detailed model then check model, or vice versa?)**
  - **Is it Chicken->Egg or Egg-> Chicken … Depends on situation**
- **Level of Detail of DES modeling should be matched to LOD of technology/concept being evaluated…**
  - **No need to go deep on LOD if technology/concept is not fully defined…**
  - **Little utility in low LOD model if concept is matured and subtleties of system behavior are being analyzed.**
- **Importance of having a consistent organization-wide modeling strategy**
  - **Consistent methodology with related baselined models leads to predictability of approach…**
  - **Baseline model needs to be flexible enough to model wide ranges of technology parameters without requiring structural changes / rework**

Questions?

Backup Material

MEU Force Structure and Major Equipment

- 2236 Personnel



- 101 HMMWV
- 24 MTVR
- 5 LVS
- 8 Misc.

- 4 M1A1
- 16 AAV/EFV
- 8 LAV
- 6 155mm

- 12 MV-22
- 4 CH-53E
- 6 AH-1

MEU(SOC) Calculated Daily Supply Requirements

CNA Notional MEU

Low Intensity

8hr Vehicle Days
12hr Transport Days (MTVR/LVS)
24hr Generator Days
Low Intensity Ammo Usage

	Weight (lb)	Volume	
Class I (Subsistence)	10401.12	386.78	ft3
Water	99457.76	11929.6	gal
Class II (General)	3525.426	?	ft3
Class III (POL)	101969	14567	gal
Class IV (Engineer Supplies)	15079.76		ft3
Class V (Ammunition)	10528.68	207.1458	ft3
Class VI (Personal Items)	N/A	N/A	ft3
Class VII (Major End Items)	N/A	N/A	ft3
Class VIII (Medical)	2050.4		ft3
	20.79269	**ST Dry Supply**	
	11929.6	**Gal Water**	
	14567	**Gal POL**	

High Intensity

12hr Vehicle Days
12hr Transport Days (MTVR/LVS)
24hr Generator Days
High Intensity Ammo Usage

	Weight (lb)	Volume	
Class I (Subsistence)	10401.12	386.78	ft3
Water	99457.76	11929.6	gal
Class II (General)	3525.426	?	ft3
Class III (POL)	122021.4	17431.63	gal
Class IV (Engineer Supplies)	15079.76		ft3
Class V (Ammunition)	37104.4	747.3565	ft3
Class VI (Personal Items)	N/A	N/A	ft3
Class VII (Major End Items)	N/A	N/A	ft3
Class VIII (Medical)	2050.4		ft3
	34.08055	**ST Dry Supply**	
	11929.6	**Gal Water**	
	17431.63	**Gal POL**	